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FINANCIAL FRICTIONS AND REAL DEVALUATIONS

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Resumen
En este documento se estudian los efectos de devaluaciones reales sobre el producto usando una muestra de fuertes devaluaciones reales para un grupo de países emergentes y desarrollados. Se encuentra que los efectos de hoja de balance, capturados por la interacción entre la devaluación real y el nivel de endeudamiento externo del país, tienen un efecto negativo y significativo sobre el producto. Sin embargo, al mismo tiempo, existe evidencia de un efecto positivo de la devaluación real asociada al efecto expansivo tradicional. Para países con un nivel de deuda externa en moneda extranjera elevado, la devaluación real será probablemente contractiva en el corto plazo, aunque estos efectos pueden ser revertido en el mediano plazo. Finalmente, países con mercados financieros más desarrollados experimentan menores pérdidas de producto a continuación de la devaluación.

Abstract
In this paper I study the effects of real exchange rate devaluations on output performance using a sample of large devaluation episodes for a group of emerging and developed countries. I find that balance sheet effects, captured by the interaction between the real exchange rate devaluation and the level of external indebtedness of the country, have a significant and negative impact on output. Nevertheless, there is also evidence of a positive effect of the real devaluation associated to the traditional expansionary effect. For countries with large foreign-denominated external debt, the combined effect of the real exchange rate depreciation is likely to generate significant output losses in the short-run. However, in the medium term, the expansionary effect of the real devaluation tends to dominate the balance sheet effect, which implies a positive effect on output in the medium term. Finally, countries with deeper financial market experience lower output losses following a devaluation.

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1 Introduction

After a series of massive devaluations in East Asian countries in the period 1997-1998, that were followed by severe output losses, a number of authors questioned the possibility of using the exchange rate as a shock absorber. Despite the fact that a devaluation of the exchange rate could have been effective in generating a necessary change in relative prices, balance sheet effects on firms and banks, associated to the devaluations, were pointed out as the causes behind output and investment collapses. Balance sheet effects may play a crucial role in the transmission of a devaluation on the economy if aggregate demand is constrained by the net worth of agents[1], and if a considerable amount of the borrowing that these agents have obtained has been denominated in foreign currency. In this case, by weakening the economy's balance sheet, a devaluation amplifies the effect of financial frictions, pushing down aggregate demand, output and employment. Therefore, and in contrast with the conventional wisdom, a devaluation is potentially contractionary.

Recent theoretical work has shown that, despite the negative effects associated to a devaluation due to the dollarization of liabilities problem, it seems likely that a flexible exchange regime still plays an insulating role when facing an external shock. Céspedes, Chang and Velasco (2003, 2004), Gertler, Gilchrist and Natalucci (2003) and Devereux and Lane (2003), among others, have constructed models for small open economies where balance sheets of firms play an explicit role. They show that even when balance sheet effects are present, flexible exchange rates may still perform better than fixed regimes in terms of output losses when adjusting to negative external shocks. The logic is simple, net worth depends not only on debt repayments but on return on capital. Fixed regimes defend the peg by increasing interest rates. However, this increase reduces output and the return on capital generating a

[1]For example, due to informational frictions in the borrowing process as emphasized by Bernanke and Gertler (1989).

negative effect on net worth. However, these authors also show that there are situations in which the contractionary effect of the devaluation dominates. In particular, Céspedes, Chang and Velasco (2003) show that a situation in which the negative balance sheet effects dominate the competitiveness effect is more likely when the financial markets are less developed, the ratio of total debt to net worth is high and the share of dollar debt in total debt is high. Now, if financial frictions are not "too severe" or financial markets are more developed, and the level of indebtedness of the economy is not "too high", a less pronounced fall in net worth under a devaluation is likely to occur when an adverse shock hits the economy. In these cases, devaluations are likely to be expansionary.

In this paper I address the effects of real exchange rate devaluations on output performance empirically. For this purpose, I use a sample of large devaluation episodes for a group of emerging and developed countries that took place in the last 25 years. In particular, I study the evolution of GDP growth during the first two years after the devaluation. I find that balance sheet effects, captured by the interaction between the real exchange rate devaluation and the level of external indebtedness of the country, have a significant negative effect on output. But there is also a positive effect of the real devaluation on output associated to the traditional expansionary effect of the devaluation. This expansionary effect is less significant in explaining the evolution of output growth during the first year after the devaluation. However, it is a significant determinant of output growth during the second year following the devaluation. Therefore, my results indicate that policy makers in countries with external borrowing in foreign currency may face a policy dilemma. If they allow the exchange rate to depreciate, they are likely to suffer significant output losses in the short-run. Nevertheless, it is also likely that the real depreciation will generate a positive effect on output in the medium term. I also find that the deepness of the financial markets is an important determinant of the evolution of output after such devaluation.

In particular, countries with deeper financial market experience lower output losses following a devaluation.

The paper is organized as follows. Section 2 reviews empirical evidence regarding the effects of exchange rate devaluations on output. Section 3 provides the theoretical framework in which this paper is based on. Section 4 contains a description of the main variables included in the empirical analysis. In section 5 the evidence found is presented, and section 6 concludes.

2 Review of literature

There are several channels through which exchange rate devaluations may affect negatively output stressed by previous theoretical literature on contractionary devaluations. A devaluation may affect aggregate demand negatively because it triggers an income distribution from high marginal propensity to consume to low marginal propensity to consume as in Díaz-Alejandro (1963) and Krugman and Taylor (1978). If investment depends on the real exchange rate because in order to produce capital firms need to import capital goods from abroad, a depreciation of the exchange rate increase the cost of producing capital, when measured in terms of the foreign good, and therefore decrease investment and aggregate demand. Additionally, a devaluation may reduce aggregate demand if the trade balance is in deficit as imported goods become more expensive (Krugman and Taylor (1978)). A devaluation may also reduce output through its negative impact on aggregate supply. By increasing the cost of imported inputs and therefore the costs of production, a devaluation reduces aggregate supply. Finally, if the increase in demand for labor from the benefited tradable sector pushes wages up, there could be a negative effect on aggregate supply.

The empirical literature on the effects of devaluations on output tends to be mixed and has been concentrated mainly in the effects of devaluations on output for developing countries. Cooper (1971) shows that the contractionary

effects of devaluations tend to be significant but they have only short run effects. Consistent with these previous results, Edwards (1986) shows that devaluations generate a small contractionary effect on output in the first year after the devaluation. However, this negative effect is completely reversed by the second year. Therefore, in his analysis, devaluations are neutral in the long run. These results are obtained using a set of controls for other possible determinants of output growth. Recently, Magendzo (2002) has argued that the fact that devaluations are found to be contractionary in previous studies is related to the fact that the same variables that determine the probability of a devaluation determine the rate of growth of output. He finds that after controlling for a selection bias problem, the contractionary effects of previous studies disappear, devaluations are found to be neither contractionary nor expansionary.

Using a sample of currency crisis episodes for 91 developing economies, Gupta, Mishra and Sahay (2001) show that in a significant fraction, crises are associated with higher output. Larger and more developed countries tend to suffer more in terms of output following a currency crises. Among the factors that explain the severity of the crisis are capital inflows previous to the crisis, oil prices, and the evolution of the exchange rate in trade partners. Recently, Hutchinson and Noy (2004) investigate the determinants of output losses following a currency and banking crisis. They show that currency and banking crises have significant negative effects of output performance on a two-four year period. They do not find that the interaction effects between currency and banking crises exacerbate output losses. De Gregorio and Lee (2004) find that among the main determinants of output losses for a sample of East Asian and Latin American countries are external factors, as measured by trade partner's GDP growth, and the level of international reserves previous to the currency crisis. They also find that expansionary monetary policy and the exchange rate devaluation have positive effects on output. Cavallo, Kisselev, Perri, and Roubini (2002) present some evidence,

using a sample of 23 devaluation episodes for a group of middle income and developed countries in the nineties, that indicates that countries with initial high levels of foreign debt tend to suffer exchange rate devaluations that go beyond the equilibrium devaluation. This overshooting of the exchange rate is associated to larger output losses when interacting with the initial level of external debt.

A recent contribution to the literature of exchange rate devaluations and macroeconomic performance using micro-level data is the work of Bleakley and Cowan (2002). They investigate empirically the consequences on investment of holding foreign currency denominated debt during a exchange rate realignment using a sample of non-financial firms from Latin American countries. They find that the competitiveness effect of the devaluation dominates the negative effect associated to increases in debt service due to debt denomination or net-worth effect. Several studies that have followed this work, using also micro-level data, tend to confirm Bleakley and Cowan's results.

Another work that investigates empirically the role played by balance sheets, this time not in output but in the country risk premium, is the one by Berganza, Chang and García-Herrero (2004). Using country risk premium data for a sample of twenty seven emerging countries provided by JP Morgan (EMBI), they find robust evidence in favor of negative balance sheets effects, measured by the interaction between the real exchange rate and the level of indebtedness, on country risk premium. These negative effects are driven by countries with larger financial imperfections.

3 Theoretical framework

The theoretical framework used in this paper is closely related to the work of Céspedes, Chang and Velasco (CCV) (2003, 2004), Devereux and Lane (2003), Gertler, Gilchrist and Natalucci (2003), and Choi and Cook (2004). The basic idea is that the existence of financial frictions make balance sheets

play a central role in the transmission of external shocks. In particular, consider the case of a small open economy for whom the risk premium that domestic firms (or banks) have to pay in order to borrow abroad is determined endogenously by their net worth, as in Bernanke and Gertler (1989). A higher level of debt with respect to net worth, tends to amplify the negative effect of a devaluation on investment, output and employment when debt contracts are denominated in foreign currency. Additionally, a more financially developed market tends to reduce the effects of the devaluation on aggregate demand by making the conditions of borrowing (risk premium), less sensitive to changes in net worth.[2]

As stressed by CCV (2004), despite the potential negative balance sheet effects, devaluations of the exchange rate may still play an insulating role in the presence of external shocks. The logic behind this is simple. Net worth also depends on output, which is stabilized through the standard Mundell-Fleming mechanism. In summary, as indicated by CCV (2003), the final result will depend on the structural parameters and initial conditions of the economy. In particular, they show that a devaluation may be contractionary if:

- the financial markets are less developed.
- the ratio of total debt to net worth is high.
- the share of dollar debt in total debt is high.

In a related family of models that stress the role of collateral in the provision of credit, Christiano, Gust and Roldós (2004) show that under a certain set of conditions, a cut in interest rate is optimal when facing an exogenous tightening in the collateral constraint (identified as a financial crisis). These conditions include substantial substitution possibilities among factors of production and not strong diminishing returns. In this model, if

[2]See Céspedes (2001)

the tradable sector is able to absorb resources from the non-tradable sector rapidly, an expansionary policy following a financial crisis, or a devaluation of the exchange rate, may be the optimal response.

Recently Cavallo, Kisselev, Perri, and Roubini (2002) show that in the presence of a margin constraint on the domestic country, a devaluation may have significant negative effects on domestic output for countries with high levels of debt. By reducing the value of domestic assets with respect to international liabilities, the devaluation increases the probability of making the margin constraint binding and, therefore, the probability of fire sales that exacerbates the negative effects on wealth and activity. They argue that fixed regimes may dominate flexible regimes by avoiding the damaging exchange rate overshooting. Mendoza and Smith (2002) construct a model where collateral constraints, also modelled in the form of margin requirements, and asset trading costs are introduced in a standard small open economy. They show that when the debt-equity ratio is high, productivity shocks of the same magnitude that drive a regular business cycle may generate large current account reversals and collapses in consumption through its effects in asset prices.

In this paper I use the interaction effect between the real exchange rate and the external debt to capture the balance sheet effects associated to the devaluation when external debt is denominated in terms of a foreign currency. This interaction will determine the size of the *contractionary effect* of the devaluation on output. By taking advantage of the cross sectional differences in the levels of debt, the interaction term between the size of the devaluation and the external debt should capture the balance sheet effects associated to the devaluation, while an *additional* term for the exchange rate should capture the *competitiveness effect* of the devaluation on output, which is associated to the ability of the economy to move resources from the non-tradable sector to the tradable one or the ability of the exportable sector increase production in response to the devaluation. The following specification aim to capture

these elements:

$$\begin{aligned} \Delta Y_j &= \alpha_0 + \alpha_1 \Delta E_j + \alpha_2 \Delta E_j \times (DEBT_j) + \\ & \quad \alpha_3 PROF_j + X_j \beta + \epsilon_j \end{aligned} \tag{1}$$

where ΔY_j is the rate of growth of output after the devaluation episode j, ΔE_j is the real exchange rate depreciation (with a positive value reflecting a devaluation), $DEBT_j$ is the level of external indebtedness of the economy at the moment of the devaluation, $PROF_j$ is the level of development in the financial market (a higher value implies a more developed financial market), and X_j is a row vector of other control variables that have been stressed in previous works on output losses after large devaluations.[3]

As can be inferred from the previous equation, the effect of the real exchange devaluation may be positive or negative. Taking a partial derivative of ΔY_i with respect to the real devaluation we obtain:

$$\frac{\partial \Delta Y_j}{\partial \Delta E_j} = \alpha_1 + \alpha_2 (DEBT_j) \tag{2}$$

The expected sign for α_1 is positive. For α_2, we expect the sign to be negative. Are devaluations expansionary in terms of output or investment? The answer to this question will depend on the sign of the partial derivative. If the sign of $\frac{\partial \Delta Y_i}{\partial \Delta E_i}$ is positive (negative), we refer to this as an expansionary (contractionary) devaluation.

[3] At this point it is worth mentioning a conceptual difference between my work and the one by Cavallo, Kisselev, Perri, and Roubini (2002) beyond the difference in the samples under analysis. Their work is based on the existence of a margin constraint on the domestic economy. When this constraint is hit, fire sales of domestic assets cause an overshooting of the exchange rate that generates strong wealth effect through balance sheets. Therefore, they center their analysis in the role played by the overshooting of the real exchange rate. Here, I am interested in the total effect of the real devaluation on output as the financial constrain is always binding. Moreover, I decompose this effect into two different effects: a competitiveness one and a contractionary effect.

Distinguishing the cases when a devaluation may be contractionary or expansionary is at this point an empirical task. In the following, I test the main implications of the theoretical framework here presented and, with the empirical results at hand, I test how relevant the arguments against monetary policy independence can be.

4 Data description

I center my analysis on a sample of 82 large devaluation episodes for a set of middle income and developed countries occurred in the period 1980-2001. This strategy leaves out of the analysis an important amount of episodes of large devaluations in low income countries. I do this for two reasons. First, balance sheet effects are likely to be a relevant phenomenon for developed and middle income economies. Low income countries tend to suffer credit rationing and financial repression. Under these conditions, the transmission mechanism is different from the one discussed in this paper. Despite not considering low income country devaluation episodes in the analysis, the number of episodes used in the empirical estimation is similar to previous studies. The second reason for concentrating in large devaluation episodes is that, as previous studies report, it is precisely during these episodes that the contractionary effects of real devaluations tend to be stronger.[4] As in Milesi-Ferretti and Razin (1998) and Frankel and Rose (1996), I consider those cases in which the nominal depreciation during the first year following the devaluation is greater than 15% and it is not reversed in the year immediately after.

In order to make my results comparable with previous empirical literature on output losses after a devaluation, I initially study the evolution of average output growth, with respect to its trend growth, during the first and

[4]See Rajan and Shen (2002) and Berganza, Chang and García-Herrero (2004).

second years following the initial devaluation.[5] I use two measures for the real exchange rate. In the first case, and as in previous empirical studies on contractionary devaluations (see for example Edwards (1986)), I use a real exchange rate index constructed as the nominal exchange rate with respect to the U.S. dollar times the ratio of the U.S. CPI index relative to the domestic CPI index. The second proxy used in the empirical analysis is the real effective exchange rate taken from the World Development Indicators. In the case of middle income countries, most of the foreign borrowing is denominated in terms of U.S. dollars which justify the use of the real exchange rate vis a vis the U.S. in order to capture the balance sheet effects. Nevertheless, the competitiveness effect may be better captured by the evolution of the real effective exchange rate that corresponds to the value of each currency against a weighted average of several foreign currencies where the weights reflect the relative importance of each of the other countries in trade flows. For this reason I use both measures in my analysis.

A key variable in the analysis is the level of external indebtedness of the economy. For emerging economies the data comes from the World Bank database and corresponds to the total external debt with respect to GDP. For the case of developed countries, I use the data reported by the IMF-BIS on external assets and liabilities to construct their net external debt position.[6] This variable is different from the one reported by the World

[5] In the cases in which quarterly data is not available, I use the rate of growth of output of the year in which the devaluation occurred for those that occurred in the first half of the year and the year following the devaluation for those occurred in the second half of the year. The trend growth rate of output corresponds to the average growth previous to the devaluation.

[6] Net external debt for developed countries is defined as debt securities liabilities and other investment liabilities minus debt securities assets and other investment assets. For some developed countries this data is not available from the IMF-BIS database for the 1980's. In those cases, I use Milesi-Ferretti and Lane's database. The main potential consistency problem when using Milesi-Ferretti and Lane's database is the fact that portfolio investment assets and liabilities are not separated between equity and debt. As portfolio

Bank for developing countries as includes the external asset position of the country. Nevertheless, the difference between these two concepts (external and net debt) is of lesser importance due to the fact that the total amount of external assets of the developing countries in the sample is not considerable.[7]

Another key variable in the empirical analysis, that has been stressed in the imperfect financial markets literature, is the degree of financial development. In order to account for the financial markets deepness, I use two different measures. The first one corresponds to the rule of law index as in La Porta, Lopez-de-Silanes, Schleifer and Vishny (1997). This index is an assessment of the law and order tradition in the country produced by the country-risk rating agency International Country Risk. Higher values for the index imply deeper financial markets.[8] Additionally, I use as a proxy to measure deepness in the financial markets corresponds to the total credit extended to the private sector by financial intermediaries as a percentage of GDP. As Levine, Loayza and Beck (2000) argue, this variable should tend to reflect higher level of financial services and therefore a more robust financial system. Higher values for these indexes should dampen the negative effects of devaluations as the imperfections in the financial markets are less binding.

Finally, the remaining group of variables used in the empirical analysis are expected to reflect the impact of external conditions on output performance. Three are the main variables used for this purpose: the rate of growth of commercial partners, the terms of trade and the real interest rate in the US.[9] Controlling for these factors is key in the empirical implementation in order to distinguish the effects of these shocks on output performance from

equity investment has become a prominent component of this portfolio investment only since the 1990's, this should not be of major importance.

[7] In fact, this is the case for those cases in which there is data available to made the comparison.

[8] As shown by La Porta and Lopez-de-Silanes (1998), this rule of law index is consistently related to deeper financial markets after controlling for GDP level, and legal origin.

[9] All of them with respect to their sample average.

the effect of the exchange rate. This is especially relevant, as discussed by Edwards (1986), given the fact that the actual exchange rate devaluation may be (in part) endogenous to the magnitude of the external shock that the economy faces. In this case, not controlling for external factors may bias the coefficient associated to the exchange rate in the regression analysis.[10]

5 Empirical Results

The first step in the empirical implementation is the estimation of equation 1 using OLS (see table 1). The first result that emerges from the empirical analysis under this specification is that the coefficient associated to the interaction between the real exchange rate and the level of external indebtedness is negative and significant, indicating the presence of strong balance sheet effects. Also, there is no evidence of a competitiveness effect associated to the real exchange rate term. Additionally, countries with deeper financial markets, proxied by the rule of law index, experience lower output losses following the devaluation. External factors, represented by the terms of trade, the GDP growth of commercial partners and the world interest rate, play a significant role explaining the evolution of output.

An additional measure used in the empirical literature to proxy for financial deepness is the credit provided to the private sector as a percentage of GDP. When I use this measured instead of the rule of law index, the results do not change significantly with the exception of the significance of the financial deepness proxy itself. This result should not be surprising as many of these devaluation episodes were preceded by credit booms that did not necessarily imply deeper financial markets.[11] I prefer using the rule of law

[10] I avoid using domestic variables in the analysis, other than the real exchange rate, as independent variables to reduce simultaneity problems. Regarding the potential endogeneity of the real exchange rate, I will explicitly address this issue in the next section.

[11] See Gourinchas, Landerretche and Valdés (2001).

index as a measure of financial deepness because as it has been documented by La Porta, Lopez-de-Silanes, Schleifer and Vishny (1997) this variable is highly correlated with broader indicators of financial deepness for both debt and equity markets.[12] Finally, the degree of openness of the economy and the reversal in capital flows, commonly used in this type of studies, are not found significant.

A second proxy for the real exchange rate used in this paper is the real effective exchange rate. This measure, in contrast to the previous one that corresponds to a bilateral real rate with respect to the U.S., is a weighted average of several currencies where the weights reflect the relative importance of each of the other countries in trade flows. Nevertheless, the results obtained from this specification are consistent with the previous ones.

One potential problem with the previous estimations is that the exchange rate devaluation could be correlated with some omitted variable and therefore, may not be a completely exogenous variable. In this case, not only the real exchange rate would be endogenous but also its interaction with the level of external indebtedness.[13] In order to solve this potential simultaneity problem, I use a three-stage least square procedure. The instruments used included all the exogenous variables in the previous estimations plus lags of the misalignment of the real exchange rate, lags of the rate of devaluation and the level of external indebtedness. Additionally, products and square roots of these variables are used as additional instruments for the interaction term between the real exchange rate and external debt.

The new estimations indicate that once we control for the simultaneity problem, the elasticity of the interaction term between the real exchange rate and the external debt is approximately two times larger than in the

[12] Also, this index is available for all the countries in my sample.

[13] In fact, Durbin-Wu-Hausman test results indicate that this is the case for the estimations presented in tables 1 and 2. Therefore, the estimates obtained by least squares would not be consistent.

previous estimations (see tables 3 and 4).[14] In the case of the estimations in which I use the real effective exchange rate, I find that the competitiveness effect is positive and significantly different from zero. Therefore, despite having a negative effect through balance sheets, the real devaluation has a positive effect on activity. Real devaluations could be contractionary or expansionary depending on the size of external debt. Economies with large external debt are likely to experience a contractionary devaluations as our theoretical framework would predict. Again, the level of financial deepness has the expected sign and is significant in most of the specifications.[15]

So far I have assumed that all the external debt is denominated in terms of foreign currencies. In order to check how significant these results are to relaxing this assumption, I use a variable constructed by Hausmann and Panizza (2002) on foreign debt currency denomination. Using data on international debt securities from the Bank of International Settlements, they construct an index that measures the percentage of international securities that a country issue in foreign currency. If a country issues all its external debt in foreign currency this index take a value equal to 1. It turns out that this assumption is reasonably good for middle income countries. However, for developed countries it may overestimate the amount of "relevant" liabilities. Unfortunately, this data on external debt denomination is available only starting in 1993. Nevertheless, I will proceed assuming that the external debt denomination during the nineties was similar to the one in the eighties.

Table 5 presents the results when an interaction term among the real exchange rate devaluation, the external debt and an index of the fraction of external debt denominated in foreign currency is used in the estimations. The results tend to confirm my previous findings.

[14]The J-tests for overidentifying restrictions indicate that the set of instrument I have used in the analysis are appropriate in the sense that are not correlated with the error term of the GDP growth equation.

[15]However, for the estimations in which I use the ratio of domestic credit to GDP as the proxy for financial deepness, this variable is not significant.

The previous specifications have as a dependent variable the average evolution of GDP in the two years after the devaluation with respect to the GDP growth average in previous years. How are the results affected if we run regressions for output growth during the first and second year separately? It turns out that the effects of real devaluations on output through the competitiveness and balance sheet effects seem to depend on the time horizon. In the first place, the evolution of output during the first year seems to be explained by the interaction effect between the real devaluation and the external debt, but there is no evidence of a competitiveness effect operating on output during the first year after the devaluation. Additionally, the only external variable significantly explaining the evolution of output during the first year is the evolution of commercial partner growth. The terms of trade and the world interest rate were not found to be significant determinants of output growth in these estimations.[16]

Regarding the estimations for the evolution of output during the second year after the devaluation, the coefficient associated to the balance sheet effect of the real devaluation is found to be significant while the competitiveness effect is also significant not only for the estimation that uses the real effective exchange rate, as in previous estimations, but also for the estimation that uses the real exchange rate vis a vis the U.S..[17] This evidence indicates that the competitiveness effect tends to take some time to operate, which is in line with previous results.[18] Finally, all the external factors included in this estimation are significant explanatory variables for the evolution of output during the second year.

In order to check if the previous results may be capturing other differ-

[16] Including lags for the external controls do not alter these results.

[17] J-tests for endogeneity of the real exchange rate for these estimations do not reject the null of no endogeneity. Therefore, I also report OLS estimates for the estimations explaining the evolution of output during the second year after the devaluation as these estimates should be more efficient.

[18] See Edwards (1986).

ences between developed and middle income countries, I excluded from the estimations the European countries in the sample. The results obtained from this strategy indicate that the balance sheet and competitiveness effects seem to be robust within developed and middle income economies (see table 6).

The phenomenon of dollarization used in this paper is one corresponding to the denomination of external debt. However, domestic financial markets, for the countries in the sample, may also be dollarized.[19] In this case the real devaluation not only affects the economy because external debt is denominated in foreign currency, but also because domestic liabilities are denominated in terms of a foreign currency while presumably an important fraction of income is generated in domestic currency. In order to assess how important this effect may be, I use a proxy for domestic dollarization that measures the fraction of domestic loans provided by the financial system that is denominated in foreign currency. Unfortunately this series is only available for half of the episodes in the sample, however, some useful insights can be obtained. In particular, I find that the degree of *domestic* dollarization is a significant explanatory variable for the evolution of output during the year of the devaluation. Countries that exhibit higher degrees of domestic dollarization tend to suffer higher output losses.

The next robustness check that I performed consists in evaluating if the results change when controlling for the exchange rate regime in place at the moment of the devaluation. In particular, I estimate if the results are different when considering only countries with less flexible exchange rate system.[20] No major changes to my previous results are obtained. One possible explanation for this is that the importance of the exchange rate regime is already captured by one of the variables that I use as instrument in my regressions: the misalignment of the real exchange rate. If more rigid regimes suffer

[19] See Savastano (1992, 1996).

[20] *Less* flexible regimes include de jure pegged and intermediate regimes from Ghosh, Gulde and Wolf (2002).

larger misalignments of the real exchange rate previous to the devaluation, the effect of the exchange rate system will be reflected on the size of the real devaluation. Additionally, the exchange rate regime may have a significant effect on the decisions of hedging made by private agents. A fixed regime may increase the desirability of borrowing in foreign currency even for firms whose income is not linked to this foreign currency in order to take advantage of lower and more stable interest rates. Part of this effect should be reflected is reflected by the fraction of debt denominated in foreign currency, especially in the case of the estimations that use a proxy for domestic dollarization.

Some authors have stressed that the output losses associated to currency crisis may be augmented if a banking crisis occurs at the same time.[21] In order to avoid simultaneity problems, I introduce in my analysis a dummy variable that takes the value of 1 if a banking crisis occurred in the year previous to the year of the devaluation episode. My results indicate that countries that experienced (or were experiencing) a banking crisis previously to the devaluation endured higher output losses. A banking crisis reduces output growth between 1.5 and 2% in annual terms.

Taking advantage of the fact that endogeneity tests do not reject the hypothesis of no endogeneity of the real exchange rate in the estimation of output growth during the second year after the devaluation, I am able to do some computations in order to determine the total effect of the exchange rate devaluation on output performance during the second year after the devaluation.[22] The effect of the real exchange rate devaluation on output performance for country (or episode) j will be given by:

[21] See for example Hutchison and Noy (2004).

[22] It would be much difficult to do this in the three stage least square estimation as the real exchange rate devaluation and the interaction term between the real devaluation and the external debt are treated as different endogenous variable to avoid the forbidden regression problem (see Wooldridge (2002)).

$$\frac{\partial \Delta Y_j}{\partial \Delta E_j} = \alpha_1 + \alpha_2 (DEBT_j) \tag{3}$$

Now, when dealing with interactions effects, the standard inference analysis must be slightly adjusted. The coefficient associated with the real exchange rate in table 4, and its significance level, reflect the effects of the real exchange rate on output when the level of external debt is equal to zero. Therefore, when the level of external debt is equal to zero, the devaluation is expansionary. In order to obtain the significance levels for other levels of foreign debt I follow Aiken and West (1991). In particular, I create a new variable *DEBT(Z)* by subtracting from *DEBT* the value of net foreign debt to GDP, *Z*. I generate a new interaction effect between the real exchange rate devaluation and the new level of indebtedness (*DEBT(Z)*). Next, I run the same regressions as in table 4 using *DEBT(Z)* and the new interaction effect. The significance level of the coefficient associated to the real exchange rate in these regressions will be the one used to assess the significance level of the next partial derivative:

$$\frac{\partial \Delta Y}{\partial \Delta E} = \alpha_1 + \alpha_2 (DEBT(Z))$$

I provide the elasticity of output to changes in the real exchange rate for different levels of foreign debt and their significance levels in the table 9 . The results indicate that for countries with level of external debt, adjusted by the fraction of this that is denominated in terms of foreign currency, higher than 54%, the devaluations tend to be contractionary. For levels of external debt lower than 6% of GDP, the real devaluation is expansionary.

6 Conclusions

Recent theoretical studies have challenged the alleged autonomy of monetary policy delivered by flexible exchange rates. In a scenario in which debts are

high and denominated in terms of a foreign currency, the conventional wisdom, flexible rate perform better than fixed rates when dealing with external shocks, do not hold. In this context, by reducing net worth, a devaluation has negative effects on investment and through this on aggregate demand and employment. Recently, Céspedes, Chang and Velasco (2003, 2004) have shown that the Mundell-Fleming logic still operates as long as financial markets are not too underdeveloped and the level of indebtedness is not too high.

In this paper I have empirically addressed the effects of real exchange rate devaluations on output performance. Using a sample of large devaluation episodes for a group of emerging and developed countries I have studied the evolution of GDP growth during the first two years after the devaluation. My results indicate that balance sheet effects have indeed a significant negative effect on output. Nevertheless, I also find evidence for the existence of a positive effect of the real devaluation on output associated to the traditional expansionary effect of the devaluation. This expansionary effect is less important to explain the evolution of output during the first year after the devaluation while it is a significant determinant of output growth during the second year following the devaluation. Adding up these two effects, I found that for countries with significantly high levels of external indebtedness, real devaluations tend to be contractionary in terms of output during the first and second years after the devaluation. I have also found that the deepness of the financial markets is an important determinant of the evolution of output after such devaluation. In particular, countries with deeper financial market experience lower output losses following a devaluation.

Finally, the results here presented indicate that policy makers in countries with external borrowing in foreign currency may face a policy dilemma. If they allow the exchange rate to depreciate, they are likely to suffer significant output losses in the short-run. Nevertheless, it is also likely that the real depreciation will generate a positive effect on output in the medium term.

A Appendix

A.1 Data sources and definitions

GDP Total: Average annual output growth, with respect to its trend growth, during the first and second years following the initial devaluation. The trend growth rate of output corresponds to the average growth previous to the devaluation. Source: World Development Indicators.

GDP Year 1: Average annual output growth, with respect to its trend growth, during the first year following the initial devaluation. The trend growth rate of output corresponds to the average growth previous to the devaluation. Source: World Development Indicators.

GDP Year 2: Average annual output growth, with respect to its trend growth, during the second year following the initial devaluation. The trend growth rate of output corresponds to the average growth previous to the devaluation. Source: World Development Indicators.

Real Devaluation: Annual change of the real exchange rate constructed as the nominal exchange rate with respect to the U.S. dollar times the ratio of the U.S. CPI index relative to the domestic CPI index. Sources: IFS and World Development Indicators.

Real Effective Devaluation: Annual change of the real effective exchange rate index. Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. The weights reflect the relative importance of each of the other countries in trade flows. Sources: World Development Indicators and IMF.

External Debt: Total external debt is debt owed to nonresidents repayable in foreign currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. External debt for developed countries is defined as debt securities liabilities and other investment liabilities minus debt securities assets and other investment

assets. Sources: World Development Indicators, IMF-BIS Database and Lane and Milesi-Ferretti (2001).

Rule of Law: Law and order tradition index. Source: International Country Risk.

Domestic Credit: Domestic credit provided to private sector. Source: World Development Indicators.

Terms of Trade Change: Annual change of the terms of trade in goods. Sources: WEO and World Development Indicators.

Commercial Partners Growth: Weighted average growth of commercial partners. The weights for each country correspond to the participation of exports in total. Source: World Development Indicators and Trade Statistics (IMF).

World Real Interest Rate: USA real interest rate. The real interest rate is the deposit interest rate less the rate of inflation measured by the GDP deflator. Source: World Development Indicators.

Openness: Exports plus imports of goods and services as a ratio GDP. Source: World Development Indicators.

Change Capital Flows: Annual change of private capital flows (net) to GDP. Source: WEO.

Original Sin: One minus the ratio between the stock of international securities issued by a country in its own currency and the total stock of international securities issued by the country. Source: Hausmann and Panizza (2002)

Dollarization: Fraction of loans provided by the financial sector denominated in foreign currency in the year previous to the devaluation. Sources: Arteta (2003), Savastano (1992 and 1996), Barajas and Morales (2003) and central banks bulletins.

A.2 Episodes

Country	Date	Country	Date
Argentina	1981Q2	Guatemala	1986Q2
Argentina	1987Q1	Guatemala	1989Q4
Argentina	2002Q1	Iceland	1993Q2
Australia	1985Q1	Indonesia	1983Q2
Australia	1997Q4	Indonesia	1997Q3
Austria	1981Q2	Ireland	1981Q2
Belgium	1981Q2	Ireland	1993Q2
Bolivia	1982Q1	Israel	1983Q4
Brazil	1983Q1	Israel	1989Q1
Brazil	1999Q1	Italy	1981Q2
Bulgaria	1996Q2	Italy	1992Q4
Cameroon	1994Q1	Jamaica	1983Q4
Chile	1982Q2	Japan	1996Q1
Colombia	1997Q3	South Korea	1980Q1
Costa Rica	1981Q1	South Korea	1997Q4
Costa Rica	1991Q1	Macedonia, FYR	1997Q3
Czech Republic	1997Q2	Malaysia	1997Q3
Denmark	1981Q2	Mauritius	1979Q4
Dominican Republic	1985Q1	Mexico	1982Q1
Dominican Republic	1990Q3	Mexico	1985Q3
Ecuador	1982Q2	Mexico	1994Q4
Ecuador	1985Q4	Netherlands	1981Q2
Ecuador	1999Q1	New Zealand	1997Q4
Finland	1981Q2	Norway	1981Q2
Finland	1992Q4	Norway	1992Q4
France	1981Q2	Papua New Guinea	1994Q4
Germany	1981Q2	Papua New Guinea	1997Q4
Greece	1992Q4	Peru	1982Q4

Country	Date
Philippines	1983Q2
Philippines	1997Q3
Portugal	1981Q2
Portugal	1993Q2
Singapore	1997Q4
Slovak Republic	1999Q1
South Africa	1996Q2
South Africa	1998Q3
Spain	1981Q2
Spain	1992Q4
Sweden	1981Q2
Sweden	1992Q4
Taiwan	1997Q4
Thailand	1997Q3
Trinidad and Tobago	1985Q4
Trinidad and Tobago	1993Q2
Turkey	1994Q1
Turkey	2001Q1
United Kingdom	1981Q2
United Kingdom	1992Q4
Uruguay	1982Q4
Venezuela	1984Q1
Venezuela	1989Q1
Venezuela	1995Q4

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Table 1
Output Losses

Dependent Variable: GDP Total	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)
Real Devaluation	0.011	0.021	0.007			
	(0.026)	(0.027)	(0.026)			
Real Effective Devaluation				0.035	0.026	0.033
				(0.053)	(0.055)	(0.053)
(Real Devaluation) x (External Debt/GDP)	-0.096	-0.114	-0.089			
	(0.046)**	(0.047)**	(0.045)*			
(Real Effective Devaluation) x (External Debt/GDP)				-0.193	-0.183	-0.186
				(0.094)**	(0.102)*	(0.092)**
Rule of Law	0.044		0.048	0.052		0.055
	(0.014)***		(0.014)***	(0.012)***		(0.013)***
Domestic Credit/GDP		0.014			0.010	
		(0.010)			(0.011)	
Terms of Trade Change	0.093	0.089	0.095	0.074	0.071	0.077
	(0.028)***	(0.029)***	(0.029)***	(0.029)**	(0.031)**	(0.030)**
Commercial Partners Growth	0.681	0.521	0.685	0.641	0.465	0.648
	(0.184)***	(0.188)***	(0.191)***	(0.189)***	(0.200)**	(0.205)***
World Real Interest Rate	-0.303	-0.306	-0.261	-0.420	-0.435	-0.385
	(0.128)**	(0.144)**	(0.145)*	(0.123)***	(0.143)***	(0.139)***
Openness			-0.007			-0.005
			(0.011)			(0.012)
Change Capital Flows/GDP (-1)			0.071			0.056
			(0.114)			(0.117)
No. Observations	82	82	82	76	76	76
R2	0.42	0.36	0.43	0.46	0.37	0.47

Heteroskedasticity-robust standard errors in parantheses; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 2
Output Losses

Dependent Variable: GDP Total	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)
Real Devaluation	0.016	0.019	0.028			
	(0.028)	(0.029)	(0.029)			
Real Effective Devaluation				0.142	0.192	0.160
				(0.060)**	(0.072)***	(0.065)**
(Real Devaluation) x (External Debt/GDP)	-0.173	-0.196	-0.183			
	(0.044)***	(0.046)***	(0.045)***			
(Real Effective Devaluation) x (External Debt/GDP)				-0.490	-0.634	-0.498
				(0.108)***	(0.134)***	(0.113)***
Rule of Law	0.040		0.035	0.046		0.049
	(0.014)***		(0.013)***	(0.015)***		(0.015)***
Domestic Credit/GDP		0.010			-0.006	
		(0.009)			(0.011)	
Terms of Trade Change	0.092	0.089	0.073	0.089	0.094	0.095
	(0.026)***	(0.028)***	(0.027)***	(0.030)***	(0.035)***	(0.030)***
Commercial Partners Growth	0.748	0.616	0.696	0.638	0.457	0.631
	(0.167)***	(0.167)***	(0.163)***	(0.189)***	(0.210)**	(0.188)***
World Real Interest Rate	-0.302	-0.304	-0.349	-0.533	-0.609	-0.481
	(0.176)*	(0.186)*	(0.180)*	(0.193)***	(0.223)***	(0.197)**
Openness			-0.001			-0.001
			(0.011)			(0.012)
Change Capital Flows/GDP (-1)			0.052			0.045
			(0.069)			(0.080)
No. Observations	80	80	76	75	75	75
R2	0.38	0.29	0.43	0.25	-0.06	0.29

Three-stage least squares estimation; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 3
Output Losses

Dependent Variable: GDP Total	(3.1)	(3.2)
Real Devaluation	0.024	
	(0.028)	
Real Effective Devaluation		0.143
		(0.060)**
(Real Devaluation) x (External Debt/GDP) x (Original Sin)	-0.189	
	(0.045)***	
(Real Effective Devaluation) x (External Debt/GDP) x (Original Sin)		-0.501
		(0.108)***
Rule of Law	0.041	0.052
	(0.014)***	(0.015)***
Terms of Trade Change	0.091	0.081
	(0.027)***	(0.029)***
Commercial Partners Growth	0.755	0.587
	(0.171)***	(0.188)***
World Real Interest Rate	-0.294	-0.494
	(0.177)*	(0.187)***
No. Observations	76	71
R2	0.39	0.33

Three-stage least squares estimation; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 4
Output Losses

Dependent Variable:	GDP Year 1		GDP Year 2			
	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)[1]	(4.6)[1]
Real Devaluation	-0.032		0.071		0.060	
	(0.043)		(0.035)**		(0.032)*	
Real Effective Devaluation		0.088		0.206		0.131
		(0.082)		(0.075)***		(0.071)*
(Real Devaluation) x (External Debt/GDP) x (Original Sin)	-0.118		-0.225		-0.181	
	(0.068)*		(0.057)***		(0.041)***	
(Real Effective Devaluation) x (External Debt/GDP) x (Original Sin)		-0.514		-0.501		-0.321
		(0.148)***		(0.135)***		(0.135)**
Rule of Law	0.055	0.048	0.030	0.057	0.032	0.058
	(0.022)**	(0.021)**	(0.018)*	(0.020)***	(0.019)*	(0.022)**
Terms of Trade Change	0.012	-0.015	0.168	0.177	0.160	0.159
	(0.042)	(0.040)	(0.033)***	(0.039)***	(0.040)***	(0.046)***
Commercial Partners Growth	0.913	0.618	0.577	0.554	0.575	0.608
	(0.267)***	(0.256)**	(0.215)***	(0.252)**	(0.227)**	(0.269)**
World Real Interest Rate	0.257	-0.171	-0.844	-0.817	-0.831	-0.772
	(0.276)	(0.255)	(0.222)***	(0.251)***	(0.213)***	(0.183)***
No. Observations	76	71	76	71	78	72
R2	0.16	0.14	0.48	0.42	0.46	0.42

Three-stage least squares estimation; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.
(1): OLS estimation.

Table 5
Output Losses

Dependent Variable:	GDP Total		GDP Year 1		GDP Year 2	
	(5.1)	(5.2)	(5.3)	(5.4)	(5.5)[1]	(5.6)[1]
Real Devaluation	0.015		-0.052		0.063	
	(0.032)		(0.050)		(0.031)**	
Real Effective Devaluation		0.103		0.033		0.163
		(0.061)*		(0.089)		(0.076)**
(Real Devaluation) x (External Debt/GDP) x (Original Sin)	-0.164		-0.073		-0.183	
	(0.054)***		(0.083)		(0.044)***	
(Real Effective Devaluation) x (External Debt/GDP) x (Original Sin)		-0.404		-0.400		-0.367
		(0.112)***		(0.163)**		(0.144)**
Rule of Law	0.036	0.046	0.046	0.046	0.026	0.046
	(0.018)**	(0.020)**	(0.029)	(0.029)	(0.025)	(0.031)
Terms of Trade Change	0.099	0.086	-0.002	-0.033	0.184	0.192
	(0.032)***	(0.033)***	(0.051)	(0.049)	(0.043)***	(0.050)***
Commercial Partners Growth	0.807	0.632	1.026	0.672	0.590	0.643
	(0.191)***	(0.206)***	(0.307)***	(0.300)**	(0.253)**	(0.307)**
World Real Interest Rate	-0.415	-0.857	0.433	-0.203	-1.321	-1.420
	(0.305)	(0.307)***	(0.488)	(0.448)	(0.417)***	(0.381)***
No. Observations	55	50	55	50	57	51
R2	0.39	0.39	0.11	0.10	0.51	0.49

Three-stage least squares estimation; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.
(1): OLS estimation.
Regressions excluding European countries.

Table 6
Output Losses

Dependent Variable:	GDP Total		GDP Year 1		GDP Year 2	
	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)[1]	(6.6)[1]
Real Devaluation	0.070		0.044		0.114	
	(0.036)*		(0.057)		(0.055)**	
Real Effective Devaluation		0.141		0.105		0.190
		(0.066)**		(0.099)		(0.089)**
(Real Devaluation) x (External Debt/GDP) x (Original Sin)	-0.200		-0.152		-0.287	
	(0.057)***		(0.088)*		(0.079)***	
(Real Effective Devaluation) x (External Debt/GDP) x (Original Sin)		-0.387		-0.311		-0.437
		(0.119)***		(0.179)*		(0.162)**
Rule of Law	0.017	0.043	0.023	0.043	0.006	0.039
	(0.018)	(0.018)**	(0.029)	(0.027)	(0.022)	(0.025)
Terms of Trade Change	0.148	0.154	0.000	0.006	0.241	0.235
	(0.055)***	(0.061)**	(0.087)	(0.091)	(0.087)***	(0.102)**
Commercial Partners Growth	0.274	0.322	0.567	0.621	0.137	0.269
	(0.259)	(0.278)	(0.411)	(0.418)	(0.376)	(0.441)
World Real Interest Rate	-0.756	-0.681	-0.428	-0.381	-1.042	-0.967
	(0.238)***	(0.246)***	(0.379)	(0.369)	(0.318)***	(0.321)***
Dollarization	-0.044	-0.026	-0.118	-0.102	0.037	0.031
	(0.029)	(0.032)	(0.046)**	(0.048)**	(0.041)	(0.046)
No. Observations	41	41	41	41	42	42
R2	0.65	0.59	0.43	0.44	0.61	0.54

Three-stage least squares estimation; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.
(1): OLS estimation.

Table 7
Output Losses

Dependent Variable:	GDP Total		GDP Year 1		GDP Year 2	
	(7.1)	(7.2)	(7.3)	(7.4)	(7.5)[1]	(7.6)[1]
Real Devaluation	0.004		-0.047		0.050	
	(0.027)		(0.043)		(0.032)	
Real Effective Devaluation		0.114		0.032		0.109
		(0.059)*		(0.083)		(0.078)
(Real Devaluation) x (External Debt/GDP) x (Original Sin)	-0.155		-0.085		-0.169	
	(0.043)***		(0.068)		(0.039)***	
(Real Effective Devaluation) x (External Debt/GDP) x (Original Sin)		-0.456		-0.407		-0.282
		(0.109)***		(0.151)***		(0.148)*
Rule of Law	0.041	0.058	0.061	0.061	0.025	0.053
	(0.015)***	(0.016)***	(0.024)**	(0.022)***	(0.017)	(0.022)**
Terms of Trade Change	0.084	0.065	0.001	-0.041	0.158	0.158
	(0.025)***	(0.028)**	(0.042)	(0.038)	(0.040)***	(0.046)***
Commercial Partners Growth	0.927	0.737	1.059	0.673	0.769	0.869
	(0.181)***	(0.204)***	(0.300)***	(0.281)**	(0.243)***	(0.299)***
World Real Interest Rate	-0.308	-0.582	0.260	-0.269	-0.870	-0.814
	(0.176)*	(0.186)***	(0.291)	(0.255)	(0.232)***	(0.196)***
No. Observations	64	59	64	59	66	60
R2	0.43	0.33	0.14	0.17	0.53	0.48

Three-stage least squares estimation; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

(1): OLS estimation.

Excluding de jure flexible exchange rate regimes

Table 8
Output Losses

Dependent Variable:	GDP Total		GDP Year 1		GDP Year 2	
	(8.1)	(8.2)	(8.3)	(8.4)	(8.5)[1]	(8.6)[1]
Real Devaluation	0.007		-0.033		0.037	
	(0.030)		(0.047)		(0.023)*	
Real Effective Devaluation		0.108		0.033		0.119
		(0.062)*		(0.089)		(0.061)*
(Real Devaluation) x (External Debt/GDP) x (Original Sin)	-0.183		-0.103		-0.181	
	(0.045)***		(0.069)		(0.038)***	
(Real Effective Devaluation) x (External Debt/GDP) x (Original Sin)		-0.486		-0.479		-0.376
		(0.105)***		(0.151)***		(0.125)***
Rule of Law	0.042	0.049	0.056	0.041	0.034	0.055
	(0.014)***	(0.014)***	(0.022)***	(0.021)**	(0.018)*	(0.021)**
Terms of Trade Change	0.082	0.066	0.008	-0.030	0.148	0.143
	(0.027)***	(0.028)**	(0.042)	(0.041)	(0.040)***	(0.047)***
Commercial Partners Growth	0.809	0.654	0.904	0.657	0.675	0.711
	(0.170)***	(0.177)***	(0.269)***	(0.257)**	(0.209)***	(0.245)***
World Real Interest Rate	-0.215	-0.397	0.195	-0.093	-0.709	-0.703
	(0.190)	(0.180)**	(0.300)	(0.261)	(0.187)***	(0.183)***
Banking Crisis (-1)	-0.014	-0.013	-0.008	-0.005	-0.022	-0.021
	(0.007)*	(0.007)*	(0.011)	(0.010)	(0.010)**	(0.011)**
No. Observations	73	68	73	68	75	69
R2	0.43	0.44	0.13	0.06	0.55	0.51

Three-stage least squares estimation; *** significant at 1% level, ** significant at 5% level, * significant at 10% level.
(1): OLS estimation.

Table 9
Elasticities of Output to a Real Devaluation

(External Debt/GDP) x (Original Sin)	Elasticity	Std. Error	P-Value
115.2%	-0.148	0.033	0.00
69.0%	-0.065	0.023	0.01
61.0%	-0.050	0.022	0.03
54.0%	-0.038	0.022	0.10
35.9%	-0.005	0.024	0.83
15.0%	0.033	0.028	0.24
10.9%	0.040	0.029	0.17
6.0%	0.049	0.030	0.10
0.0%	0.060	0.032	0.06
-14.5%	0.086	0.036	0.02

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